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FOREST INSECT SURVEY

JACK-PINE BUDWORM ON THE RAPID RIVER RANGER DISTRICT, UPPER MICHIGAN NATIONAL FOREST - SEASON OF 1950

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The jack-pine budworm, Choristoneura sp., is a native forest defoliator commonly found attacking jack pine. Designation of the insect as the jack pine budworm is based on the concept that the form on pine is distinct from that on spruce and fir, although taxonomists have yet to show specific morphological differences. Previously referred to as the spruce budworm, Choristoneura fumiferana (Clem.) or its variety, more general acceptance is currently being given to the present name.

The jack-pine budworm has occurred in outbreak numbers from time to time in various areas throughout the range of its host. Graham (1935) states that it has been locally injurious in the Great Lakes region since it was first observed on jack pine in 1923, and he suggests that similar damage probably occurred periodically prior to that time but was overlooked. In spite of a great increase in the abundance of jack pine, following the cutting of virgin stands that were predominantly white and red pine, outbreaks have continued to be localized rather than region-wide in nature. In Michigan infestations of this character were common in the thirties, but apparently somewhat less so in the early part of the last decade. More recently there has been some indication that the jack-pine budworm was again becoming abundant in the State.

STANDS AFFECTED

In the spring of 1949, damage by the jack-pine budworm was reported by District Ranger James H. Jay on the Rapid River District, Upper Michigan National Forest. The report was confirmed by this office following examination of specimens submitted by Ranger Jay. The infestation occurred in plantations on the sand plains of the Stonington peninsula, east of the mouth of the Whitefish River and the upper reaches of Little Bay de Noc. It is not known how long the jack-pine budworm has been active in this area, but it is probable that the insect was present for several years prior to 1949. It is unlikely that it occurred in numbers sufficient to cause conspicuous injury, for the affected area is traversed by one of the main routes across the upper peninsula and heavy defoliation could scarcely have passed unnoticed.

The affected stands are comprised primarily of blocks of planted jack pine, and a much smaller area of planted red pine, most of which has been established within the last 15 years. Dispersed through these plantings are numbers of naturally established jack pine, for the most part considerably older than the planted trees. Many of these are scattered orchard type trees of the kind that commonly produce staminate flowers in abundance which favor the development of the jack-pine budworm. Many also occur in groups of varying size overtopping the planted trees. Individual natural jack-pine in open groups and those on the borders of the denser groups exhibit the characteristics of the orchard type trees to different

degrees. Quite aside from their predilection to budworm attack, many of these trees are of extremely poor form. They crowd out or cause the suppression of younger competing trees, and are in general silviculturally undesirable components of the stand.

SURVEY METHODS AND PROCEDURES

In the fall of 1949, personnel of the Rapid River District made a reconnaissance survey of the pine stands on the Stonington peninsula to determine the extent of the budworm infestation. The area of discernible injury was mapped on October 25 by Assistant Ranger Harold E. Bergman. This spring, prior to the normal emergence of the hibernating larvae, rearings were conducted to provide a rough indication of over-winter survival of the larvae. Four lots of jack pine samples, each containing 20 to 30 12-inch twigs, were collected by E. G. Sandstrom on March 21, 1950 at widely separated points within the infestation area. In rearing, during the following month, larvae emerged from all but one of these lots, indicating that at least some of the population had survived and that the infestation might be expected to continue. This expectation was confirmed by field examinations on June 12 from which it was apparent that there was a considerable population of larvae at work.

Observations showed that there was some variation in the density of the larval population and consequent severity of damage. In order to delimit the area according to degrees of infestation, an intensive survey was made by C. R. Eaton and H. C. Chapman between June 26 and July 1. At half-mile intervals along parts of the road network traversing the area, sampling stations were established. The interval between sampling stations was determined by speedometer readings. From four to six chains away from the road, on either side, counts were made of the number of budworms on three 15-inch twig samples taken from jack pine. In most cases planted trees 8 to 15 feet in height were sampled, but where these were not available, naturally established trees within the same size range were used wherever possible. These records were supplemented by counts taken in connection with an experimental aerial spraying operation within the infested area, which will be reported on in detail separately. Defoliation estimates were omitted because the amount of foliage consumed at the time of the survey was generally light to medium, and it was not considered practical to apply a percentage estimate to the losses. Upon completion of the field work, the location of the sampling stations was plotted as accurately as possible on a large scale (4 inches to 1 mile) map and the distribution of the samples by forty-acre units was determined from this map.

RESULTS

The reconnaissance survey made by Forest Service personnel in the fall of 1949 showed the gross area infested to be approximately 7,370 acres (Figure 1). Within this area counts were made at 30 check points established in the course of the survey and at 25 additional locations sampled in connection with the spraying study (See Table 1, Appendix). The intensity of

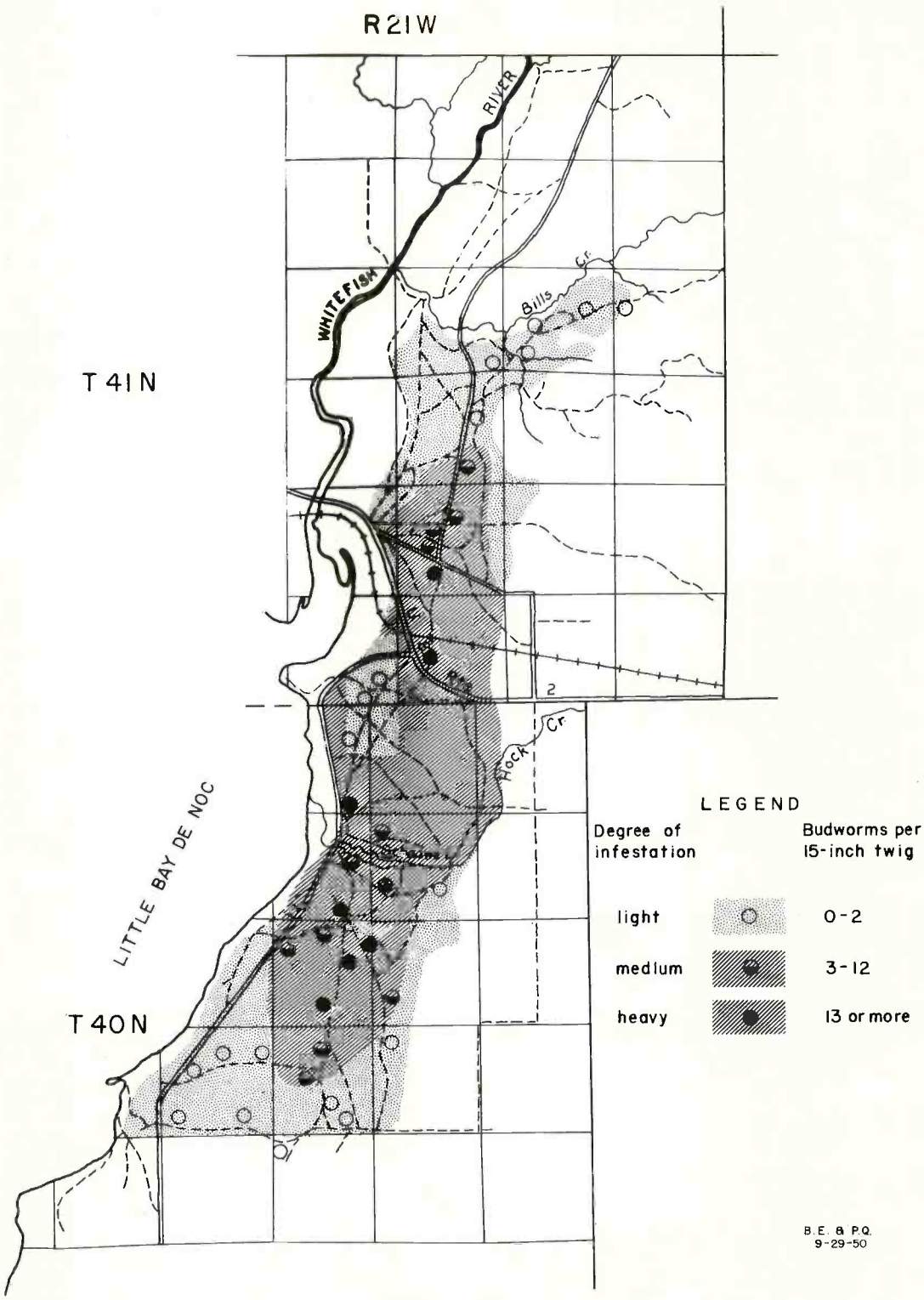

Figure 1.

Jack pine area on the Rapid River Ranger District infested with jack-pine budworm in 1950.

the infestation at each of these locations was arbitrarily classified as light, medium, or heavy on the basis of the average number of budworms per 15-inch twig for the 6 samples collected. The range in the average number of budworms found at each station was from 0.1 to 24.2 per twig. The number of check points falling within each infestation category is as follows:

Degree of Infestation	No. of Larvae per 15-inch twig	No. of Check Points
Light	0 - 2	36
Medium	3 - 12	20
Heavy	13 or more	7

In the accompanying map, Figure 1, a distinction has been made between the area of light infestation and that of medium and heavy infestation. The delineation is based on information obtained as a result of the budworm counts, and observations made in reconnoitering the area. Except for one area of approximately 320 acres, (SE 1/4 and part of NE 1/4 Sec. 33, T. 41 N., R. 21 W., E 1/2 NE 1/4 Sec. 6, and W 1/2 N. W. 1/4 Sec. 5, T. 40 N., R. 21 W.) where the budworm population was practically eliminated following spraying, that portion of the infestation classified as light is generally peripheral to that classified as medium and heavy. The light infestation, exclusive of the treated area, covers approximately 3,210 acres. Medium and heavy infestations occur on approximately 3,640 acres. No attempt has been made to determine the status of land ownership in the infested area, but brief examination of the Forest map indicates that most of the area is federally owned.

Damage in terms of tree mortality within the infested area has thus far been negligible, although there has undoubtedly been some growth reduction in the more heavily defoliated stands. Outright mortality attributable to budworm injury has been observed only in the case of very young or suppressed trees on the borders of or underplanted beneath large-crowned, native jack pine. It is estimated that this mortality amounts to less than 1 percent of the total stand. It should be noted, however, that the budworm is known to be capable of contributing to jack pine decadence if not being the outright cause of death. Thus it is possible that more serious losses will occur if the infestation persists.

RECOMMENDATIONS

The trend that the infestation will take in 1951 is problematical. Present information on the infestation pattern suggests that the jack-pine budworm has been building up in the area, perhaps for several years. It is quite possible that this trend will continue, particularly if staminate flower production on the extensive areas of older plantations and on the naturally established orchard type trees remains heavy. It is also possible that budworm populations may decline abruptly due to natural causes, although no evidence suggestive of this development was obtained during the survey. Aside from these considerations, it should be borne in mind that other natural and planted stands susceptible to attack and capable of supporting budworm populations now present in the Whitefish Plains area occur in the immediate vicinity of the 1950 infestation. In order to protect these

stands and reduce the chances of damage in the infested area, the following action is recommended:

1. The area of medium and heavy infestation, comprised of about 3,840 acres, should be sprayed by plane in the spring of 1951. DDT in oil solution should be used and the application rate should be 1 pound in 1 gallon of oil solution per acre. The sprays should be applied during the two-week period when the budworm is in the larval stage and actively feeding on the expanding foliage. In the vicinity of Rapid River this period should occur during the last three weeks of June in a normal year.

2. Orchard type native jack pine now scattered throughout much of the infested area should be removed through sale or free use if it is economically feasible to do so. The elimination of these trees, which favor the build-up of budworm populations, may not materially affect the present outbreak, but it should do much to prevent future outbreaks.

The adoption of the foregoing recommendations is contingent upon the value placed by the land-managing agency on the affected stands, and spraying is further contingent upon the presence of the budworm in outbreak proportions in the area next June.

LITERATURE CITED

Graham, S. A. 1935. The spruce budworm on Michigan pine. U. Mich., Sch. Forestry & Conserv., B. 6. 56 pp.

APPENDIX

Table 1. Jack-pine Budworm Collections. Rapid River Ranger District, Upper Michigan N. F., 1950

	Forty	QUARTER SECTION											
		N E			N W			S E			S W		
		No. Sample Stations		Ave. No. Larvae*	No. Sample Stations		Ave. No. Larvae*	No. Sample Stations		Ave. No. Larvae*	No. Sample Stations		Ave. No. Larvae*
T 41 N, R 21 W Sec. 13	SE				1		0.2						
" 14	SE	1		0.3									
	NE										1		0.7
	SW										1		0.7
" 15	SE							1		0.7			
" 22	SE	1		1.2				1		4.7			
" 27	NE				1		12.2						
	SE				5		9.4						
	NE										5		8.4
	SE										1		16.2
" 34	NW										1		13.0
" 33	SE							6		0			
	SW							3		0			
T 40 N, R 21 W " 6	NE	4		0									
	SE	7		0.1				1		21.8			
" 7	SE	1		4.7				1		14.5			
" 8	SW				1		10.2				1		3.2
	NW							1		0.5			
" 17	NW										1		5.0
" 18	NW	1		10.0	1		4.2						
	NE	1		17.0									
	SW	1		12.5				1		24.2			
" 19	SE				1		9.8				1		1.8
	SW	1		9.2				1		1.3			
" 20	NW				1		1.2						
" 30	NW				1		0.7						
T 40 N, R 22 W " 24	SE	1		0.7	1		0.3						
	SW				1		0.3	1		0.2	1		0.2

* Per 15-inch twig sample. Basis 6 samples per station.